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The American STATISTICIAN

The news publication of the
AMERICAN STATISTICAL ASSOCIATION

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FEBRUARY 1953
Volume 7, No. 1

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RESOLUTIONS OF THE ANNUAL MEETING, December 1952

From the minutes of the Annual Business Meeting

Mrs. Wickens called upon Ralph Watkins to present the following resolutions to the membership:

1. Resolution regarding the Program Committee:

   RESOLVED that the officers and members of the American Statistical Association express deep appreciation for the excellent program prepared by members of the Program Committee under the leadership of Alfred Watson, Chairman, and Edward Bloom, Secretary.

The resolution was approved.

2. Resolution regarding Local Arrangements Committee and Chicago Chapter:

   RESOLVED that the officers and members of the American Statistical Association express their profound appreciation to the Local Arrangements Committee under the Chairmanship of Wesley Mitchell and to all of the individual members of the Chicago Chapter for their outstanding work and hospitality in connection with the arrangements for the 112th annual meeting of the Association.

The resolution was approved.

3. Resolution regarding the retirement of Sylvia Weyl:

   WHEREAS, Sylvia C. Weyl has ably and faithfully served the Association in the capacity of Executive Assistant and Editor of the American Statistician, the former from 1944 to July 1952, and the latter from 1947 to December, 1952 and has now retired from these positions;

   THEREFORE, BE IT RESOLVED, that the members of the American Statistical Association in annual meeting assembled do hereby express great appreciation of the outstanding service rendered by Mrs. Weyl during her terms of office, and hereby express our recognition of her valuable assistance so competently performed over this long term of years.

The resolution was approved.

Bus. adm.

The American STATISTICIAN

FEBRUARY 1953, VOL. VII, NO. 1

The news publication of the American Statistical Association

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Anyone wishing to change their mailing address should allow eight weeks' notice. A copy of the address taken from an issue of the periodical should accompany the change-of-address request.

NEW OFFICERS FOR 1953

The report of the Committee on Elections shows the following officers elected as a result of the balloting which was sent to the membership last November:

President-Elect	Herbert Marshall
Directors (1953-55)	Wilfrid J. Dixon
	Margaret J. Hagood
Representative-at-Large (1953-54)	Kenneth E. Miller
District Representatives—	
Northeastern District	David F. Votaw, Jr.
Eastern District	A. J. Jaffe
Southeastern District	Ezra Glaser
North Central District	William G. Madow
South Central District	John R. Stockton
Western District	Harry S. Schwartz

REPORT OF THE COMMITTEE ON FELLOWS

Beginning early in 1952, the Committee on Fellows began its deliberations and appraisal of candidates for Fellows in the American Statistical Association. Material relative to candidates who had been suggested to the Committee in earlier years was combined with new materials collected for candidates suggested as a result of a letter which the Committee sent to all current Fellows, which provided in total a large number of names and a mass of material. Preliminary sifting and appraisal was made in the first meeting of the Committee. Subsequent investigation by members of the Committee and personal correspondence by the Committee members and finally a succession of ballots led to the selection of a number of individuals from which a final selection of members to be elected was made at a meeting of the Committee held the first week in December.

Without meaning to establish a precedent, the Committee elected one member who had died during the deliberations of the Committee. If deliberation had not been underway at the time of the candidate's death, the Committee agreed that it would not have taken any steps to elect him.

In another instance, a statistician who had been a member of the society and had done work which the Committee believed warranted election was elected.

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NEWS

NBER Conference—International Statistical Institute Elections—Seminar on National Income—Seminar on Survey Research Techniques

NBER Conference on Interindustry Economics

A session of the Conference on Research in Income and Wealth, under the auspices of the National Bureau of Economic Research, was held in New York City on October 17 and 18. The session was devoted entirely to a discussion of the methodology and the empirical materials of Interindustry Economics.

The first meeting was made up of four papers dealing with the problems and the appraisal of the central elements of the technique:

Some Basic Problems of Empirical Input-Output Analysis, by W. W. Leontief, Harvard University

The Uses of Interindustry Relations Data and Methods, by W. D. Evans and M. Hoffenberg, Bureau of Labor Statistics

A Review of Input-Output Analysis, by Carl Christ, Johns Hopkins University

A Survey of Input-Output Research, by Ronald W. Shephard, Sandia Corporation

These papers were discussed by: Rutledge Vining, University of Virginia; David Rosenblatt, Washington, D. C.; Walter Jacobs, Air Force; Burton Klein, RAND Corporation; Sidney Alexander, Columbia Broadcasting System; and Milton Friedman, Chicago University.

The second meeting dealt with the preparation of the basic statistical materials for the 1947 tables. Eleven papers were prepared by the staff of the Interindustry Economics Division of the Bureau of Labor Statistics:

Final Demand Sectors, by S. A. Jaffe

The Government Sector, by Irving Licht

Foreign Trade, by M. Weitzman and P. M. Ritz

Construction, by David Siskind

The Development of the Bill of Goods for Interindustry Analysis, by S. S. Netreba

Manufacturing, by Jack Alterman and M. R. Goldman

Mining, Fuel and Power, by Jack Faucett

Agriculture, by P. M. Ritz

Services, by Gabriel Cherin

Trade, by W. I. Karr

Transportation, by A. J. Walderhaug

The discussants of this meeting were: Franco Modigliani, Carnegie Institute of Technology; M. R. Conklin, Bureau of the Census; D. G. Johnson, Chicago University; and Harold Barger, Columbia University.

The final meeting dealt with special problems of research in Interindustry Economics:

A Comparison of the Structures of Three Accounting Systems, by Stanley J. Sigel, Federal Reserve Board

Interindustry Economics and National Income Theory, by H. I. Liebling, Bureau of Labor Statistics

The Interindustry Economics Research Program of the Federal Government, by Ezra Glaser, Bureau of the Budget

Technological Change and Dynamic Models, by James Duesenberry and Anne Grosse, Harvard University

Input-Output Analysis of the Puerto Rican Economy, by Amor Gosfield, University of Pennsylvania

These papers were discussed by: Gerhard Colm, National Planning Association; George Jaszi, National Income Division, Office of Business Economics; J. D. Norton, Twentieth Century Fund; Harold Barnett, Bureau of Mines; Irwin Friend, Office of Business Economics; Harry Markowitz, RAND Corporation; Walter Isard, Harvard University; and Daniel Creamer, National Bureau of Economic Research.

Inter-American Seminar on National Income Research

An Inter-American Seminar on National Income Research was held at Santiago, Chile, January 5-17, 1953, under the sponsorship of the Government of Chile, the Statistical Office of the United Nations, the Pan American Union, and the Inter American Statistical Institute, and in cooperation with the United Nations Economic Commission for Latin America, and the Office of Business Economics of the United States Department of Commerce.

The Seminar was designed to bring together the government officials and other specialists concerned with national income research in Latin American countries for informal discussion of technical problems in the field and for exchange of information and experience on methods and techniques applicable to compilation and use of national income data. The program for the Seminar was developed around three principal topics: (a) Procedures for utilizing the results of national income research in formulation of economic policy and planning basic statistical programs; (b) interchange of information and experience on administration and operation of national income research agencies; and (c) possibilities of international cooperation in the development of professional competence in national income research. Consideration was given to technical questions of concepts, definitions and methods, on the basis of manuals prepared by the Statistical Office of the United Nations.

New Members of the International Statistical Institute

In the 1952 elections to membership in the International Statistical Institute Professor P. C. Mahalanobis of India was elected an honorary member, and 27 candidates were elected to ordinary membership. Among these were the following from the United States: Chester I. Bliss, Alfred Cowles, Wassily W. Leontief, and J. von Neumann.

Summer Institute in Survey Research Techniques of the University of Michigan's Survey Research Center

The Survey Research Center of the University of Michigan will hold its sixth Annual Summer Institute in Survey Research Techniques from July 20 to August 14, with an introductory session from June 22 to July 17, 1953. The program is designed to illustrate the theory and application of survey research to such fields as business and human relations, education, psychology and sociology, public affairs, public health, economics and statistics. A special workshop will be offered again this year in the practical application of survey research methods to these individual fields. The Institute is intended to meet the needs of men and women engaged in business and governmental research or statistical work, as well as those of graduate students and university instructors.

For further information write to the Survey Research Center. University of Michigan, Ann Arbor, Michigan.

Federal Statistical Activities

Revision of Federal Reserve Board's Consumer Credit Statistics

A program of comprehensive review and revision of the consumer credit series prepared and published by the Federal Reserve Board is nearing completion. The objectives of this program were: (1) to review the conceptual framework of the consumer credit series in order to provide the data that would best meet the needs of analysis within the limitations set by the available information; (2) to make a thorough canvass of all available information in order to incorporate any new or improved data into the series; and (3) to review the methods of extrapolation and to make all feasible improvements in the sample data used in the preparation of the estimates.

The task of reviewing the conceptual framework of the consumer credit series and of outlining the general plans for proceeding with the revision was done by a Federal Reserve System committee which included Frederick L. Deming (chairman), Vice President of the Federal Reserve Bank of St. Louis; D. Harry Angney, Assistant Cashier of the Federal Reserve Bank of Boston; Kenneth M. Snader, Statistician of the Federal Reserve Bank of Philadelphia; and Tynan Smith of the Board's staff. Later, this committee was joined by four consultants: Professor Reavis Cox, University of Pennsylvania; Professor Albert Haring, Indiana University; Duncan Holthausen, A. Holthausen and Company; and Professor Raymond J. Saulnier, Columbia University and the National Bureau of Economic Research. The Board's staff proceeded along the general lines recommended by this group and presented its work to the group for review.

It is hoped that it will be possible to present a description of the revision in the Federal Reserve *Bulletin* in the spring of 1953 and to substitute the revised estimates for the present series at that time.

HOMER JONES,
Chief, Consumer Credit and Finances Section, Division of Research and Statistics, Board of Governors of the Federal Reserve System

1949 Handbook of Old-Age and Survivors Insurance Statistics

The Bureau of Old-Age and Survivors Insurance has released its annual Handbook for the year 1949. The Handbook provides information on the wage and employment experience of workers in covered employment in 1949 and during the period 1937-49. It contains the only regularly released summary data on the work history of individuals over a period of years. The statistics, which are based on a one-percent sample, or about 860,000 accounts, provide distributions by age, race and sex of the workers, as well as by annual or cumulative wages, patterns of years of employment, old-age and survivors insurance status, labor mobility, and State and industry of employment.

Copies of the Handbook may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. at $1.00 per copy

IRWIN WOLKSTEIN
Division of Program Analysis
Bureau of Old-Age and Survivors Insurance
Federal Security Agency

Revised Household Projections by the Census Bureau

The Bureau of the Census has released, in Current Population Report Series P-20, No. 42, its revised projections of the number of households, families, and related units for July 1955 and 1960. The new release supersedes similar projections released in 1946.

The basic approach used in preparing the figures was that of subdividing the projected population into successively smaller parts, first by broad marital-status categories and then by household and family-status categories. For the more important steps, the calculations were carried out on an age-specific basis, including the use of a modified cohort approach in the projection of the marital-status distribution.

High, medium and low projections were prepared on the basis of different assumptions concerning the level of fertility, mortality, and net immigration. The projected numbers of households are:

	High series	*Medium series*	*Low series*
July 1955	48,401,000	47,701,000	46,611,000
July 1960	52,402,000	50,822,000	47,985,000

Copies of Series P-20, No. 42, entitled "Projections of the Number of Households and Families: 1955 and 1960" may be obtained from the Bureau of the Census, Washington 25, D. C.

EMANUEL LANDAU,
Population and Housing Division, Bureau of the Census, Department of Commerce

Use of Prepunched Cards for Submitting State Employment Data

During the past year the Bureau of Labor Statistics has undertaken an experiment with the Division of Placement and Unemployment Insurance of the New York State Department of Labor to improve the flow of employment and payroll data from the States for the current employment statistics program. The experiment, which was originally proposed by Meredith B. Givens, Director of Research and Statistics at the New York office, involves substitution of prepunched cards for the schedules formerly submitted by the State agency.

Presentation of data from the employment and payroll reports on reproduced punch cards has proved advantageous both to BLS and to the State agency. For BLS, the new system eliminates the need for key-punching and verifying data from the schedules. At the State level, it eliminates the necessity for packaging, shipping and controlling large numbers of schedules, and also permits the schedules to be available to the State for the maximum amount of time during each month before they are shuttled back to the employers.

As a result of the success of the experiment with New York State, the new system will be extended to other States. BLS is making similar arrangements with California and Ohio, and expects to negotiate also with several smaller States which can meet the specifications for handling this type of transmittal.

SEYMOUR L. WOLFBEIN,
Chief, Division of Manpower and Employment Statistics, Bureau of Labor Statistics, Department of Labor

THE FUTURE ANNUAL MEETINGS OF THE ASSOCIATION WILL BE HELD AS FOLLOWS:

	Headquarters	Dates
1953—Washington, D. C.	Shoreham Hotel	December 27-30, 1953
1954—Montreal, Canada	Hotel Mt. Royal	September 10-13, 1954
1954—Regional Meeting, San Francisco	(This will be held in December. Final dates and hotel have not yet been chosen.)	
1955—New York City	Hotel Biltmore	(Late in December. Final times not yet chosen)

RESEARCH DESIGN FOR STUDIES OF THE MOBILITY OF WORKERS IN CRITICAL OCCUPATIONS

By HAROLD GOLDSTEIN
Bureau of Labor Statistics
U. S. Department of Labor

Paper presented before a panel on Recent Developments in Occupational Mobility Research, 112th Annual Meeting of the American Statistical Association, Chicago, December 29, 1952.

Always of interest for its potential contribution to the economic theory of the labor market, research in occupational mobility acquires immediate practical significance in connection with the appraisal of mobilization problems. In anticipating manpower requirements for prospective defense programs and balancing them against the potential labor supply, we are usually posed problems of gross increases in demand for skilled and professional workers in some sectors of the economy, accompanied by decreases in other sectors. Effective manpower administration requires making sure that workers of the requisite skill and the desired numbers shift from one industry or employer or part of the country to another, and that workers move from occupations for which there is less need to those which become critical in defense industries. To get some idea of the feasibility of such shifts, to gain an understanding of the frequency with which workers make them, and to understand the factors affecting their propensity to do so, we have to find the usual patterns of working life in each occupation, and for this we look to occupational mobility research.

First of all, we ought to know something about the parameters of mobility in skilled occupations — the numbers of people involved in relation to the total number in the occupation, and the number who engage in each of several kinds of movement—industrial, geographic, occupational and from one employer to another. Second, we need to find out what factors are associated with movement of each type. Do younger men move more readily than older? Do the more experienced move more readily than the novices? Is a single man more prone to shift his job or his residence than a married man? Does a worker who has completed an apprenticeship and gained a rounded training in his trade have more flexibility in shifting from one industry to another than a worker who picked up his skill on the job and possibly learned only those parts of the trade which were relevant to that particular job and that plant's way of doing business? How do workers move from occupation to occupation—especially from the undifferentiated masses of the unskilled or semiskilled to the more specific and clearly defined crafts? What is the effect of their background and early work history? Finally, how do economic conditions affect mobility?

In order to estimate the number of workers we need to train in each occupation, two additional types of mobility information would be useful. First, how many members of the occupation have been able to enter the trade by means other than formal training or apprenticeship? With the exception of a few occupations in which entrance is rigidly restricted, through licensure or other means, most occupations in the United States are open to people who acquire the skill by informal study or practical experience. To estimate the need for apprenticeship or other formal training, one must make some allowance for this group. In the second place, the number who need to be trained for each occupation can be more closely estimated if we have information on the average annual rate of loss of members of the occupation. The impact of death and retirement on occupations can be estimated through methods based in part on actuarial data, but the rate of loss due to normal amount of shifting of members of the occupation to other occupations can only be determined by investigation of occupational mobility.

In order to make pilot studies of occupational mobility of workers in critical occupations, the Bureau of Labor Statistics undertook four studies, three with the support of the Department of the Air Force and the fourth with the support of the Office of Naval Research. The first three dealt with critical skilled occupations — tool and die makers, molders, and electronic technicians; the fourth dealt with scientists. This report describes the first three studies.

In designing this type of study, one may approach the selection of individuals to be surveyed in three different ways, or by a combination of these three. First, one may include in the survey only persons now in the occupation and find out about their past movements by means of a retrospective work history type of questionnaire. This would make it possible to trace

the means by which they entered the occupation. The second method is a follow-up study of people who were in the occupation at some time in the past. This makes it possible to get information on those who have left the occupation, which the first method would not enable us to do. It has the disadvantage, of course, of the practical difficulties faced in all follow-up surveys: that some former members of an occupation can be traced down only at great expense, but must be traced down in order to provide valid results precisely because that which we are trying to measure — mobility — is very likely to be associated with becoming lost. The third method is to trace an individual through some record-keeping system where such exists. The outstanding examples are, of course, the individual account records of the Old Age and Survivorship Insurance System and the Railroad Retirement Board, but it may also be possible to use for this purpose the records of a few unions and professional societies. The surveys about which I am reporting were first planned to include both the retrospective interview of present members of the occupation and the follow-up of past members, but the latter phase of the study was temporarily set aside because of funds limitations.

In surveying members of an occupation, the first problem is to find a representative sample. There are several methods by which this can be done. The first is a household enumeration, either of the whole population or of a sample of households. This method, suitable for use in more comprehensive surveys, was immediately rejected; with occupations of less than 100,000 members in a population of 150 million, this was too much a needle-in-the-haystack proposition. The second method is to work from lists of members of an occupation which may be available through unions, professional societies, or licensure boards. The Bureau of Labor Statistics has made surveys of this type in a number of professions. This is always an easy way to get a lot of names since the members of societies are usually listed on addressograph plates. We find, however, that, depending on the level of organization of the professional group, the members may not be fully representative of the entire occupation; in many cases society members differ markedly from the total population in the occupation in such important respects as age, education, experience, earnings, occupational status, and level of professional achievement. This approach was not feasible, in any event, for the skilled crafts in which we were interested.

A third method was tried in this case: reaching the members of the occupation through their employers. With some knowledge of the approximate industrial distribution of tool and die makers, molders, and electronic technicians, we set out to obtain a sample of workers by going to firms in the appropriate industries and obtaining the names of members of these occupations from their payrolls. This method has several advantages, although it is expensive. First, it makes it possible to identify members of the occupation clearly since we are not depending only on the individual's statement or that of some other member of his household, but also on the records and the statements of employers. Second, taking names from plant records makes it possible to get a true cross section of the members of an occupation without the bias one tends to get from a professional society membership list. And, third, by going to the employer one is able to get information on personnel and hiring practices, employer attitudes, economic and technological developments in the industry, and many other factors affecting workers' mobility — information which sheds a great deal of light on the data we are analyzing.

In order to minimize the cost of a survey, it was decided that rather than select a cross section of all employers in each industry, the survey would be restricted to seven or eight large metropolitan areas in which members of the occupation were highly concentrated. This obviously introduces a possible bias resulting from the omission of small cities with less diversified industries and, therefore, relatively smaller opportunities for job shifting by members of the occupation without a change of residence. This choice was made deliberately in view of the prohibitive cost of a complete geographic cross section. The results therefore may be considered representative only of members of these occupations in large cities — by far the majority of these workers. The cities were selected so as to represent insofar as possible the various major regions in which members of the occupations are employed; for example, the survey of tool and die makers was made in Detroit, Cleveland, Chicago, Philadelphia, Los Angeles, Hartford, and Cincinnati. The surveys of molders and electronic technicians covered eight cities.

While the selection of cities was done in such a way as to broadly represent the major geographic areas in which members of each occupation were concentrated, the selection of plants within these cities was made in such a way as to yield an accurate cross section of the industrial distribution of the members of each occupation for the United States as a whole. The sampling design in the survey of molders may illustrate. The universe listing of plants — obtained from Penton's Foundry List, supplemented by other sources — includes about 1,300 establishments. These establishments were arranged in random order in 15 cells, stratified by three size classes (1 to 50 foundry production workers, 51 to 250, and 251 and over) and five industrial categories — independent ferrous foundries,

independent nonferrous foundries, and "captive" foundries in each of the following industries: fabricated metal products, machinery (except electrical), and all other industries using foundries grouped together. Using general ratios obtained by wage surveys and other means, we estimated the number of molders and coremakers employed in each plant. In order to minimize travel costs for plant interviews, varying sample ratios were applied to the 15 cells. Among the plants in the size group over 250, one out of two plants was taken; in the group 51 to 250, one out of five; and in the smallest plants, the sampling ratio was one out of ten. The plants were then visited, plant officials interviewed by means of a special questionnaire, which included information on total employment, type of foundry, numbers and kinds of molders and coremakers employed, how the plant hires molders, apprenticeship programs, and how it adjusts its work force to increase output.

The individual workers were then selected for interview from the plant's employment records. In determining sample size, surveys of mobility present a unique technical problem in that the characteristic we are measuring—the fact of having made a job shift—applies to only a small part of the population, but one which we cannot isolate in advance. We therefore have to sample the entire population in the occupation to locate the few in whom we are interested. This requires a substantial sample to give results with sufficient accuracy. Moreover, we have to have information on the characteristics of the balance of the population so that we may compare the mobile and the nonmobile groups and determine those factors associated with mobility.

This problem is mitigated by the type of mobility survey which covers a single occupation. Certainly occupation or skill level is a significant variable affecting mobility. In any survey of mobility the data would have to be broken down by occupation or at least broad skill levels in order to be meaningful. By dealing with a single occupation we hold this one important variable constant, and can reduce the sample size greatly, or increase the amount of detail in which we analyze the effect of other variables.

In determining the size of the total sample required in each of the three occupational studies, we considered the detail in which tabulations would be broken down and the probable size of some of the cells. Taking into account these considerations and also the cost, it was decided to seek a sample in each case of approximately 1,800 members of the occupaiton.

For the survey of molders, it was estimated that the eight metropolitan areas had about 18,000 molders and coremakers, and therefore a sampling ratio of one in 10 was required within the selected cities. Workers within each plant were selected using ratios which depended upon the sampling ratio used in selecting the plant from its cell. For example, in the large plants which had been selected from their cells on the basis of one out of every two plants, the workers were selected on a random basis from the payrolls on a one to five ratio. Thus the over-all sampling ratio for workers in large plants was one out of ten. In the medium-sized plants where the original sampling ratio had been one in five, a ratio of one molder out of two was used in selecting employees' names from the records, so that the over-all ratio of one in ten was maintained. Similarly, in the smallest plants, which had been selected on a one-out-of-ten basis, *all* molders' names were taken. This method automatically assigned proper weighting to the respondents. The names, addresses, and telephone numbers of the individual employees were entered on a form.

Provision was made for nonresponse or lack of cooperation by the plants by drawing a reserve sample from the original list of plants minus the ones selected for the first sample. These reserve plants were used to substitute for those which did not participate in the survey. In the same way, an alternative list of workers was selected to allow for refusals, inaccessible addresses, or failure to locate the workers.

The workers were interviewed at home by means of a questionnaire which provided for information on their work histories for a 11-year period, 1940 to 1950, and for such personal characteristics as age, place of birth, education, marital status, and number of dependents, how the employee was trained for his occupation, and his first job. In the work history, information was obtained on the dates of each job or period of unemployment, the name and address of the firm, the industry and occupation, and reasons for changing jobs. A final question asked about the influences which led him to select this trade and his opinion about the trade as a career for young people, and also his father's occupation.

The data from these surveys are now being analyzed; a summary report on the first—the tool and die maker survey—has been published.[1] In analyzing the four types of mobility, two measures of mobility were used: the number of men who moved, and the number of moves per worker. In order to make the data on

[1] *The Mobility of Tool and Die Makers*, 1940-1951, U. S. Department of Labor, Bureau of Labor Statistics, Bulletin No. 1120. Washington, Government Printing Office, 1952. 67 pp.

CONTINUED ON PAGE 8

SLIDERULE, KELLY, SLIDERULE!

By PRICE DAY

The leading article in the latest JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION is entitled, "The World Series Competition." Its author is Frederick Mosteller, a Harvard statistician.

Having failed (because we did not try) to get in touch with Dr. Mosteller, we are forced in the interview which follows to rely on quotations from his piece. All quotations are *verbatim*. The "A" of the dialogue is Dr. Mosteller. The "Q" is us. "Kibitzer" is a kibitzer, who is largely ignored.

Q. Doctor, what do you wonder about as a World Series approaches?

A. Which team will win.

Q. As a statistician, do you wonder about anything else? If so, what?

A. Will the World Series be very effective in identifying the better team.

Q. Well, won't it?

A. If we compare pairs of teams, products, drugs or persons on the basis of a fixed number of binomial trials, and identify the number of the pair that wins the majority of trials as the better, we may be in error.

Kibitzer. Binomial Baby, I Love You. Use binomial in a sentence: When you're in Alaska, if you come by Nome I'll be glad to give you a drink.

Q. For example?

A. For example, if the members of a pair are evenly matched, a decision on the basis of performance is equivalent to coin-flipping.

Q. Perhaps you could explain a bit more fully, doctor.

A. By assuming that the probability that a particular team wins single games is fixed throughout a series, we can readily illustrate our point. Suppose team A and team B are matched in a series, and that the probability that A wins single games is p equals 0.52. Then team A is the better team, because it has the higher probability of winning single games, but in a short series team A may have little better than a 50-50 chance of winning. For example, in a three-game series, team A can win by winning the first two games, the first and third, or the second and third.

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Kibitzer. Yogi Berra knows that much. He might put it different.

A. The probabilities of these three outcomes are (0.52) squared, (0.52) (0.48) (0.52), and (0.48) (0.52) squared, respectively.

Kibitzer. (Now) (you're) (cooking), (doc.)

A. These values add up to 0.529984, or about 0.530, which means that team A's chances to win the three-game series is not a very big improvement over its chance to win a coin-flipping contest. The corresponding computation for a seven-game series shows a small improvement in the probability that team A wins; the value is about 0.544.

Q. Upon what assumptions, Dr. Mosteller, is all this based?

A. The twin assumptions needed by a binomial model are that throughout a World Series a given team has a fixed chance to win each game, and that the chance is not influenced by the outcome of other games. It seems worthwhile to examine these assumptions a little more carefully, because any fan can readily think of good reasons why they might be invalid.

Kibitzer. Berra busts a pinkie. Mantle is worrying about his draft board. Cox ate too much supper. A man named Throckmorton in Tier D, a florist with a shop on Rogers avenue Chicago, suddenly remembers the series of 1919, weeps, removes his glasses to dry his eyes, and the sun hits the glasses and reflects into Furillo's face, and Furillo drops an easy fly. Gil Hodges don't hit. How do you explain Hodges statistically?

A. Of course, strictly speaking, all such mathematical assumptions are invalid when we deal with data from the real world.

Kibitzer. Speaking *not* strictly, how do you explain Hodges?

A. The question of interest is the degree of invalidity and its consequences.

Kibitzer. How do you explain Hodges?

Q. Doctor, in brief, what is your estimate of the average probability that the better team will win a World Series??

A. 0.80.

Q. Can you tell us how you arrived at that?

A.
$$\frac{\sum_{i=1}^{k} S(p_i, n)}{k} \neq S(p, n)$$

$$p = \frac{\sum_{i=1}^{k} p_i}{k}$$

Kibitzer. Did you say

$$E(x|x > a) = \frac{\int_o^\infty xf(x)dx}{\int_o^\infty f(x)dx} ?$$

A.
$$\frac{\sum_{i=1}^{k} S(p_i, n)}{k} \neq S(p, n)$$

$$p = \frac{\sum_{i=1}^{k} p_i}{k}$$

Kibitzer. Oh. Thanks.

A.
$$E\sum_{i=1}^{k} (\dot{p}^i - \bar{p})^2 = \frac{n-1}{n}$$

$$\sum \sigma^2(\dot{p}_i) + n\sigma^2(p_i)$$

Q. Thank you Dr. Mosteller.

A. There should be no confusion here between the "winning team" and the "better team." The "winning team" is the team that wins the series. The "better team" is the team—

Q. Our time is up, Doctor, and thank you very much.

Kibitzer. If we compare pairs of teams, products, drugs or persons on the basis of a fixed number of binomial trials — heads or tails? How do you explain Hodges?

MOBILITY OF WORKERS —CONTINUED FROM PAGE 6

all workers in the sample comparable for analysis of activity over an 11-year period, the number of moves had to be standardized by "length of exposure to mobility" — i.e., the variation in the periods in which the workers were in the labor market in their occupation was eliminated as a factor. It was also necessary, since age was found to be a factor affecting mobility, to identify each move by the workers' age at the time of the move, rather than the time of the survey. In the later studies this tracing back of relevant factors to the time job shifts were made was extended to include marital and dependency status, home ownership, and duration and seniority status of the job from which the worker shifted.

In interpreting the data from these surveys, one of the most serious problems is the lack of normative data on mobility. It is difficult to know whether the amount of job shifting among electronic technicians is relatively large or relatively small because we have very little to compare it to. There is only a limited amount of information on mobility in individual occupations. Several of the earlier studies of the National Research Project of the WPA and the University of Pennsylvania on machinists and weavers and loom fixers in Philadelphia provide a good deal of intensive information on those occupations. In more recent periods the Monthly Report on the Labor Force of the Bureau of the Census and the decennial population census have provided some general information on movement among occupations and geographic movement which may serve as benchmarks for analysis of particular occupations. Finally, research now being carried on by universities will provide more intensive information on occupational mobility in a similar period of time and therefore will offer some useful general measures of the incidence of mobility by broad occupational groups with which to compare the detailed data. As more data on mobility are compiled, the task of analysis will be easier, and the results of each new study more revealing against the broader background.

Statistical Training For Marketing Research

This is one of a group of papers given at the 111th Annual Meeting which dealt with recent developments in the teaching of statistics.

By WROE ALDERSON
Alderson and Sessions

Statistical methods reflect man's efforts to cope with variability in the salient facts of his environment. The facts about markets and marketing programs are infected with a large measure of variability, uncertainty and risk. Every market analyst is statistician enough to recognize the element of contingency in his findings. Yet he must serve the needs of an executive who is obliged to act on a given date and not at some random point in time. The analyst may salve his conscience by qualifying the reliability of his data and yet realize that management must behave as if the data were utterly reliable if it is to act upon them at all.

As statistical methods are applied in marketing they must pass through a sort of operational funnel. Masses of divergent and often questionable data go in at one end. Irrevocable decisions come out at the other. In training a student of statistics for marketing, teach him the standard methods of dealing with variable data. Teach him something about the kind of variables which are encountered in market analysis. But, above all, never let him forget the funnel!

Stated in another way, the essential elements of good preparation are threefold. The well-trained student should be familiar with marketing data. He should command a range of statistical techniques appropriate to the analysis of these data. He should know how to focus market data upon the solution of marketing problems.

Marketing deals with opportunity and effort. It is the function of the marketing executive to establish feasible sales goals and select efficient methods of accomplishing these goals. The analyst utilizes marketing data to evaluate both opportunity and effort. Market opportunity arises from the present or potential behavior of some class of buyers. Any attempt to estimate what they will buy must eventuate in some form of forecast. Marketing effort is exerted through alternative distribution channels, advertising media, and forms of sales organization. Any attempt to assess its efficiency must eventuate in some form of productivity rating. Forecasting demand and applying standards of performance constitute the task of the statistician in marketing. There is little he will be called upon to do which will not fit under these two headings. But an enormous diversity of managerial and technical problems are bracketed by these two divisions of the subject.

Evaluation of market opportunity may be described in statistical terms as the analysis of a complex of differential growth rates. The end result is a forecast as to the sales of a product or service over some relevant operating period. This period may be as long as the time required to amortize the cost of the plant that will build the product. It may be as short as the month ahead. In either case there are movements which can be extrapolated over the period with some reliability and to which the sales growth of the product may be related. Population growth, the trend in personal incomes, consumer expenditures both in total and by sub-groups are fundamental to most forecasts of demand. National figures usually must be studied in terms of an appropriate breakdown into segments of the market. Regional differences in degree of urbanization, in climatic factors and in historical background in the use of a type of product, are among the major sources of variation among segments of the market.

A forecast of demand for an individual product may well be regarded as if it were a projection of one small segment of the national aggregates for consumer expenditures and gross product. From the viewpoint of the product in question the approach which has so far been suggested might be designated as external analysis since it undertakes to relate the growth possibilities of the product to the growth of other elements in the economy. Another approach which might be called internal analysis is one which pertains to separate factors within the growth situation of the product itself. Growth may be regarded, for example, as resulting either from an increase in number of users, an increase in average rate of use, or both. In durable goods there is the division of purchases into new buyers and replacement buyers. In industrial buying there is the difference between buying a new material or piece of equipment because it will improve the end product or because it will bring about a decrease in the cost of production.

Both external and internal analysis generally enter into demand estimates for a product. Internal analysis is especially important in evaluating a new product before it has made an established place in the market. There is a substantial body of information as to the behavior of market growth factors of both sorts. Simple straight line functions relate many types of expenditure to differences in consumer income. Statistical demand functions with considerable predictive power have been developed for a number of product classifications. The percentage of ownership for various classes of consumer durables has been found to

level off in a characteristic fashion which can be anticipated as to new products. An almost universal tendency has been observed for the leading product in any field to experience a decline in its percentage of sales in the entire field after a certain period of time.

Mention of sampling surveys has been deliberately withheld up to this point although such surveys are a characteristic feature of much market analysis. The sampling survey should be regarded as a source of supplementary information in most cases and not conducted as if nothing was previously known about that segment of the market. The sampling survey can facilitate external analysis by providing weights which can be used in relating the growth factors for the given product to the broader economic series which have been mentioned. The sampling survey is likely to provide the principal source of data for the analysis of internal growth factors.

The other broad aspect of marketing analysis deals with the productivity of marketing effort. Advertising, personal selling, warehousing, retail store location and store arrangement, the use of marketing channels, the establishment of price and discount structures are all aspects of marketing in which effort can be relatively effective or ineffective. All types of marketing effort are subject to uncertainty as to outcome and difficulties as to the data and techniques by which their efficiency can be measured. The permissible margin for error in executive judgment has been reduced by the trend of the times here as in the evaluation of markets.

The first problem in analyzing the efficiency of a marketing operation is to pick an appropriate measure of productivity. Factors affecting productivity must be identified. Variations in performance must be studied as between different products, classes of customers, sections of territory, advertising media or distribution channels. Conclusions must be reached as to how to moderate these productivity differentials, make adjustments in the controllable factors affecting efficiency, or to devise and test new methods appropriate to a changing scale of operation.

What has been said so far may seem like a roundabout way to get into the subject of statistical training for the field of marketing. It becomes pertinent if we accept the view that you cannot design a training course for a job unless you are familiar with the specifications for the job. The effort here has been to draw up such specifications in general terms, realizing, of course, that the activities of the statistician in marketing will not always match the complete pattern. Starting from this conception of the job to be done, it is possible to comment on the technical tools the marketing statistician will need and how they should be organized for use.

The marketing statistician should understand the significance of the standard types of growth curves. He should have facility in fitting such curves to data. He should be resourceful in testing and applying other types of functions when the logic of the situation does not support the use of conventional growth curves. For example, a Grompertz curve plotted in terms of per capita purchases may be suitable when the sales of a product are expected to follow population trends once consumers are habituated to its use.

The marketing statistician should be facile in the use of short cuts in this field and many others. While he may want to end up with a curve that is fitted by least squares he should be prepared to try alternative functions by cruder methods. Instead of relying on visual methods for testing he should have at hand such special graph papers as double log paper to test the appropriateness of fitting a logistic curve. He will, of course, need facility in dealing with seasonal and cyclical factors particularly if his situation requires emphasis on short-range forecasting. In all of this he needs to be familiar with such graphic aids, reference tables, and computing equipment as will permit him to work with the greatest dispatch. His superiors are constantly under the temptation to go back to more rough and ready judgments of the data if statistical precision appears to be the source of delay.

The marketing statistician should know how to draw a probability sample for the principal sampling situations arising in marketing. To be prepared for practical assignments he must not only know sampling theory but have a grasp of the actual procedures of drawing up lists for industrial sampling or utilizing maps for area sampling of consumers. He should endeavor as quickly as possible to assemble all the tools of sampling required to cope with the sampling needs of his situation. Maps for standard sampling areas can be acquired for a fraction of the cost of buying maps for the whole country before selecting areas. He should have at hand all the reference tables which can save his time if he is working alone on large or small samples or which can make work easier to delegate if he is employing a clerical staff. He should know when to recommend the use of small samples and when to insist on a full-scale survey.

The work of the statistician in the application of measures of productivity requires a considerably different organization of the tools of statistical analysis. A good place to start is with some of the work that has been done with statistical cost functions. Earlier attempts to analyze marketing costs used accounting methods adapted from the factory. Even the accounting approach has serious statistical problems such as sampling from sales invoices and other detailed business records. There are fruitful applications for analy-

sis of variance in sorting out the factors which have a significant bearing on productivity. This step can speed up the subsequent procedures by cutting down the number of factors to be included in a productivity function.

Multiple correlation and more advanced methods of dealing with multi-variables will have increasing application in productivity studies. This type of analysis will take a large part of its inspiration in the future from operations research as developed in the last war. The marketing statistician whose work tends in this direction will need better than average mathematical preparation. Promotion and advertising, as aspects of marketing effort, can be related to the study of growth curves which are employed to characterize market opportunity. They may be regarded as means for accelerating the growth of demand. Some major aspects of price strategy can be analyzed most conveniently within the same framework.

In operations analysis as in demand analysis the working statistician will be most effective if the tools of his craft are organized so that they may be used with versatility and dispatch. That means that he should be willing and able to employ crude methods of approximation in exploratory work and methods of greater precision and elegance to confirm his insights before making final recommendations. To penetrate very deeply into the problem of productivity he will have to understand the anatomy of the marketing operation he is evaluating and be able to utilize existing records or create others which measure the flow of activity from one vantage point or another.

Starting from a knowledge of the statistical job to be done in marketing and from an adequate repertoire of statistical tools there is a third element in the training of statisticians for marketing. That is to impart an overall viewpoint which facilitates the matching of the right statistical tools against each marketing job. That viewpoint may be described as a guiding philosophy which eventuates in a generalized procedure for analysis of the problem situation. Such a philosophy cannot be presented here even in summary. It is only possible to comment briefly on three of its constituent elements: statistical understanding, operational logic, and administrative awareness.

A pragmatic philosophy of statistics might start from the primary aim of analysis, namely, to predict one set of variables by study of one or more other sets of variables. Analysis of variance would be introduced as a way of looking for such relationships. The concept of variance as the sum of the squares of residual variations could provide a thread of continuity for moving on to many other topics. The chi square test employing squared deviations from expected values, the correlation coefficient as derived from a ratio between variances, a regression line as a representation of a function which minimizes the squared deviations, and sampling error as variance divided by the number of observations in the sample are illustrations. Even so common a measure as the arithmetic mean takes on new significance as the reference point in a distribution which will minimize the squared deviations. The usual method of starting the exposition of statistics with frequency distributions runs the risk of leaving the student with a conception of statistics as largely a descriptive procedure.

What is here called operational logic would also serve as a corrective for the excessively empirical approach often observed among statisticians. The art of analyzing action situations in order that information can contribute to the success of action is generally neglected. So simple a step as listing the realistic alternatives for action or that of identifying the operating assumptions of the executive or the limits within which he is free to vary the controlling factors, would give greater point and direction to the majority of marketing investigations. Operational logic poses issues for investigation and keeps the collection and analysis of data in practical focus. The contrary method of manipulating data endlessly in the hope that something will turn up usually leads to waste and frustration in a marketing situation in which management is seeking guidance for decisions.

Just as the statistician should understand the operating framework within which decisions must be made, he should understand the administrative framework within which research is to be carried out. In sample design, for illustration, the statistician will have been more useful if he makes a moderate improvement in the accuracy of sampling within the administrative framework than if he designs a plan which is theoretically sound but lies outside the bounds of administrative feasibility. The cost of research is justified only as it results in the same degree of confidence as trial and error but at a lower cost. The marketing statistician, with others in a research organization, must always be zealous to maintain the margin of advantage for research. Its cost must be much lower to offset the common preference for actual trial.

It is cheaper and faster to apply trial and error to abstract models by means of statistical and mathematical methods. Or as the statistician might express it to a hard bitten sales executive, "It is safer to do our experimenting on paper." While pushing this principle wherever it is valid, the marketing statistician can still function usefully if management prefers a full scale marketing experiment with a live model. That is, by showing how the trial run can be set up so as to yield valid experimental data.

A check with the office of the Association, however, revealed that this person hod not paid his dues within the past year. As a result, the ballot was thrown out.

As a result of considerable discussion, the Committee agreed to provide for each Fellow elected in 1952 a certificate indicating the name of the person elected signed by the members of the Committee and bearing the official seal of the Association. These certificates were presented in person to each Fellow who had been elected and who was present at the annual meetings. Certificates for those who could not attend the meeting were mailed to the newly elected Fellows immediately after the annual meetings. Citations explaining in digested form the specific reasons for the appointment were prepared by each member of the Committee and were read by the Committee's chairman upon the occasion of the introduction of the newly elected Fellows at the annual meetings. Following are the names of all Fellows elected by the Committee in 1952 and announced at the Association's annual meetings together with the addresses, positions and citations:

OSKAR ANDERSON, Professor of Statistical Methodology, University of Munich, Germany, for the origin of probability sampling in his studies of housing and other problems three decades ago; distinguished mathematical statistician, teacher and scholar.

MURRAY R. BENEDICT, Professor of Agricultural Economics and Agricultural Economist on the Giannini Foundation and in the Experiment Station, University of California, Berkeley, for notable contributions to the classification and interpretation of agricultural statistics and for extensive service on important statistical advisory committees.

MARTIN A. BRUMBAUGH, Director, Department of Statistical Analysis, Bristol Laboratories, Syracuse, New York, for his work in developing a statistics course and textbook for freshmen and for his contribution in furthering the application of principles of statistics to quality control and industrial problems and in connection therewith for his stimulus in initating "Industrial Quality Control," the national publication of the American Society for Quality Control, and in establishing the Martin Brumbaugh award.

EWAN CLAGUE, Commissioner of Labor Statistics, U. S. Department of Labor, Washington, D. C. for his work in the administration of a large government statistical agency involving plans for the development of statistical series, educating legislators, business, labor and the general public in their use and in maintaining and developing increasingly rigorous statistical standards.

DUDLEY J. COWDEN, Professor of Economic Statistics, The University of North Carolina, Chapel Hill, for his contribution to statistics through teaching monographs and the writing of textbooks which have been the first guides to statistics for more students than any other textbooks produced.

FREDERICK E. CROXTON, Professor of Statistics, Special Assistant to the Vice President and Provost as well as Interim Director of University Admissions, Columbia University, New York City, for his contribution to statistics through teaching and research and the preparation of one of the most widely used of all textbooks in statistics.

PAUL H. DOUGLAS, U. S. Senator, Washington, D. C., for his contributions in the measurement of real wages, the development of a theory of production and his use of statistics in the work of our highest legislative assembly.

W. DUANE EVANS, Chief, Division of Interindustry Economics, Bureau of Labor Statistics, U. S. Department of Labor, Washington, D. C., for his application of statistical methods and the use of statistical data in the development of measures of industrial productivity and the development and conception of methods of measuring interindustrial relations and their application to many phases of the American economic structure.

MARTIN R. GAINSBRUGH, Adjunct Professor of Economics, School of Business, New York University; Chief Economist, National Industrial Conference Board, New York City, for his stimulating and constructive influence upon many problems of economic measurement, with particular emphasis upon the difficult fields of wealth and productivity.

EDWIN B. GEORGE, Economist and Assistant to the President, Dun & Bradstreet, Inc., New York City, for highly discriminating analysis of economic data and for ceaseless stimulation of operating statisticians to develop definitions and standards required for modern economic analysis.

CYRIL H. GOULDEN, Chief of the Cereal Division, Experimental Farms Section, Canadian Department of Agriculture; for many years at the Dominion Rust Research Laboratory, Winnipeg and lecturer in Statistics, University of Manitoba, for his writings and teaching on statistical methods and the design of experiments, particularly with reference to plant breeding and improvement.

HOWARD WHIPPLE GREEN, Secretary, Cleveland Health Council; Director, Real Property Inventory of Metropolitan Cleveland, for development over many years of tract statistics for cities and surround-

ing areas, a program which has contributed greatly to better understanding of economic and social trends in urban communities.

HOWARD C. GRIEVES, Assistant Director for Economic Fields, Bureau of the Census, U. S. Department of Commerce, Washington, D. C., for progressive leadership in effecting major changes in the content and methodology of the statistics of industry and trade, thereby making the national censuses and current reports more useful than ever before to business and government.

HAROLD GULLIKSEN, Professor of Psychology, Princeton University; Research Adviser, Educational Testing Service, for his book and publications on the theory of psychological testing and his work in the application of mathematical and statistical methods to problems of psychological testing and scaling and for his contribution in developing the psychometric Fellowship program.

ANDERS HALD, Professor of Statistics, University of Copenhagen, Copenhagen, Denmark; at present in India as member of U.N.T.A.A. mission for teaching statistical quality control, for his research on time series and his book on the industrial applications of statistics which have won international recognition at an early age.

HOWARD L. JONES, General Supervisor of Statistics, Illinois Bell Telephone Company, Chicago, for original research in interpolation, curve-fitting and applications of statistical sampling and design of experiment in industry.

OSCAR KEMPTHORNE, Professor of Statistics, Iowa State College; on leaving Cambridge, he served for a time as assistant to Yates at Rothamsted, before taking up his present post at Iowa State College, Ames, for his leadership in research on the construction and analysis of incomplete block designs and his work as an able expositor of the philosophy and practice of experimentation.

NATHAN KEYFITZ, Senior Research Statistician, Dominion Bureau of Statistics, Ottawa, Canada; he was formerly mathematical advisor to the Bureau, and in 1951 he served as Statistical Advisor to the Government of Burma, for his work in contributing to improvements in sample surveys, both through theoretical research and sound practice.

ARTHUR LINDER, Professor of Statistics at the University of Geneva and at the Swiss Institute of Technology, Zurich, Switzerland, for his lectures and writings which have made him a tireless leader in the development and fruitful application of statistical methods in his native country.

FORREST E. LINDER, Statistician, Office of Vital Statistics, United Nations Secretariat, for effective leadership in bringing about world-wide improvements in collection and tabulation methods for demographic data through consultation and training programs, and through development of standard nomenclature and classification.

GIORGIO MORTARA, Census Advisor to Brazilian Institute of Geography and Statistics, Rio de Janeiro, Brazil, for distinguished work in demography, whose work in Europe and South America has everywhere enriched man's knowledge of himself.

EDWIN G. OLDS, Professor of Mathematics, Carnegie Institute of Technology, Pittsburgh, for inspiring leadership in statistical methods in industry; for his unselfish devotion to statistical societies; for original research in theory; and for teaching.

WILLIAM R. PABST, Chief Statistician, Bureau of Ordnance, U. S. Navy Department, Washington, D. C., for the administration and application of the statistical control of quality in the armed services, which has led to some of the finest examples of uniformity, economy, and effective design of materials.

DONALD C. RILEY, Deputy Chief, Office of Statistical Standards, U. S. Bureau of the Budget, Washington, D. C., for the administration of the Office of Statistical Standards, which has led to the world's leading example in the attainment of reliability, usefulness and economy of statistical information through the processes of review, coordination, and planning so as to embody the best statistical techniques.

BENEDICT SAURINO, formerly Manager, Statistical Research Division, Sun Oil Company, Philadelphia, for his development of intra-company and intra-industry statistics from both substantive and methodological points of view in periods of peace and war.

CONRAD TAEUBER, Assistant Director, Bureau oi the Census, U. S. Department of Commerce, Washington, D. C., for research on the problems of agricultural populations and migration and administrative work in the technical services of federal and international agencies which has done much to bring statistics to the service of man.

P. C. TANG, Agricultural Statistician, Food and Agricultural Organization of United Nations; employed to give technical assistance to the Government of Panama, for his tables and other statistical researches in the testing of hypotheses, which have led to world-wide recognition.

SAMUEL WEISS, Chief Statistician, Bureau of Labor Statistics, U. S. Department of Labor, Washington, D. C., for his impact on statistical techniques and for his able and unselfish devotion to the American Statistical Association.

Respectfully submitted,

LESTER S. KELLOGG

For the Committee on Fellows

December 31, 1952.

QUESTIONS and ANSWERS

Edited by W. S. CONNOR
I. R. SAVAGE

SETTING OF GO-NO-GO GAUGES

An answer has been received to Question 32, which first appeared in Volume 6, Number 3, and is here repeated for the convenience of the reader.

Question 32. In a certain production process, measurement of the important quality characteristic is costly and time-consuming. Hence inspection is done by means of a go-no-go gauge. How can the inspector determine the gauge setting so as to make his inspection most efficient?

Stated more completely, the production process turns out items normally distributed with known standard deviation σ. An inspector wishes to detect a shift in process average μ by inspecting a sample of size n with a go-no-go gauge; i.e., from the proportion of items in the sample whose values are less than the gauge value, g, he wishes to test the hypothesis $\mu = \mu_0$ at the α per cent level of significance. How shall he select g, in terms of the given parameters, so as to maximize the power of the test against a specific alternative hypothesis $\mu = \mu_1 (\mu_1 > \mu_0)$?

F. Proschan

Answer. For n = 1, the gauge setting is determined such that

$$(1) \qquad \frac{1}{\sigma\sqrt{2\pi}} \int_{-\infty}^{g} e^{-(x-\mu_0)^2/2\sigma^2}\, dx = 1 - \alpha$$

and the hypothesis $\mu = \mu_0$ is rejected if the item exceeds the gauge setting.

For $n \geq 2$, the gauge setting is $g = (\mu_0 + \mu_1)/2$. Let

$$(2) \qquad \hat{p}_0 = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\frac{\mu_1-\mu_0}{2\sigma}} e^{-t^2/2}\, dt, \quad \hat{q}_0 = 1 - \hat{p}_0,$$

and reject the hypothesis $\mu = \mu_0$ if the number, r, of items exceeding the gauge setting is such that $r \geq m$, where m satisfies the equation

$$(3) \qquad \sum_{y=m}^{n} \frac{n!}{y!\,(n-y)!} (\hat{q}_0)^y (\hat{p}_0)^{n-y} = \alpha.$$

The values of m and α may be obtained from tables of the binomial distribution [1], or for large values of n, $m = n\hat{q}_0 + t_\alpha\sqrt{n\hat{p}_0\hat{q}_0}$ where t_α is given by

$$\frac{1}{\sqrt{2\pi}} \int_{t_\alpha}^{\infty} e^{-t^2/2}\, dt = \alpha.$$

The foregoing solution limits the values of α which one can use to those satisfying (3), but it does provide the same gauge setting for all $n \geq 2$. One can formulate the solution to find the gauge setting to yield any desired value of α but the explicit solution is by no means simple.

Let us now consider the basis for the solution. If we let

$$f_i(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(x-\mu_i)^2}{2\sigma^2}\right), \ (i = 0, 1),$$

then for the case n = 1, it is desired to determine a region of acceptance A# for the hypothesis $\mu = \mu_0$ such that it is the region of greatest information [2] for observations from $f_0(x)$ for discriminating between $\mu = \mu_0$ and $\mu = \mu_1$ for all regions A of the same size. I.e., we require that A# and A satisfy

$$(4) \qquad \int_{A\#} f_0(x)dx = \int_{A} f_0(x)dx = 1 - \alpha$$

and

$$(5) \qquad \int_{A\#} f_0(x) \log \frac{f_0(x)}{f_1(x)}\, dx \geq \int_{A} f_0(x) \log \frac{f_0(x)}{f_1(x)}\, dx.$$

(We shall use logarithms to the base e throughout.) From (5) there is obtained

$$(6) \qquad \int_{A\#} f_0(x)\, x(\mu_0 - \mu_1)\, dx \geq \int_{A} f_0(x) x(\mu_0 - \mu_1)\, dx$$

or since $\mu_0 < \mu_1$,

$$\int_{A\#} x f_0(x)dx \leq \int_{A} x f_0(x)dx,$$

from which we infer that A# must be the interval $(-\infty, g)$ such that (1) is satisfied.

It should be noted that the value of g which minimizes the total error $(\alpha + \beta)$ where

$$(7) \qquad \alpha = \int_{g}^{\infty} f_0(x)dx, \quad \beta = \int_{-\infty}^{g} f_1(x)dx$$

is given by $g = (\mu_0 + \mu_1)/2$, since

$$\frac{\partial}{\partial g}(\alpha + \beta) = -\frac{e^{-(g-\mu_0)^2/2\sigma^2}}{\sigma\sqrt{2\pi}} + \frac{e^{-(g-\mu_1)^2/2\sigma^2}}{\sigma\sqrt{2\pi}} = 0$$

leads to $(g - \mu_0)^2 = (g - \mu_1)^2$.

For $n \geq 2$ the problem is essentially one of determining the most efficient grouping for a problem in discrimination. The divergence between the populations corresponding to the hypotheses $\mu = \mu_0$ and $\mu = \mu_1$, for n independent observations, is given by [2], [3] as

$$(8) \qquad J_n(0, 1) = n \int (f_0(x) - f_1(x)) \log \frac{f_0(x)}{f_1(x)}\, dx = n\left(\frac{\mu_0 - \mu_1}{\sigma}\right)^2.$$

Defining $p_i, q_i = 1 - p_i$, $i = 0, 1$ by

$$(9) \qquad p_i = \int_{-\infty}^{g} \frac{e^{-(x-\mu_i)^2/2\sigma^2}}{\sigma\sqrt{2\pi}}\, dx \quad (i = 0, 1),$$

the divergence between the resultant grouped populations as determined by the setting of the go-no-go gauge, for n independent observations, is given by [2] as

$$(10)\quad J_n'(0,1) = n\sum_{x=0}^{1}\left(\hat{p}_0^{\,x}\hat{q}_0^{\,1-x} - \hat{p}_1^{\,x}\hat{q}_1^{\,1-x}\right)\log\frac{p_0^{\,x}q_0^{\,1-x}}{p_1^{\,x}q_1^{\,1-x}}$$
$$= n[(p_0 - p_1)\log(p_0/p_1) + (q_0 - q_1)\log(q_0/q_1)].$$

In [2] it has been shown that $J_n'(0,1) \leq J_n(0,1)$ and the efficiency of the grouping has been defined by $J_1'(0,1)/J_1(0,1)$, in the sense that n of the ungrouped observations will give as effective discrimination as N grouped observations, where $nJ_1(0,1) = NJ_1'(0,1)$. Note that $J_n'(0,1) = 0$ for $g = \pm\infty$ and since $J_n'(0,1) \geq 0$ and is a convex function [2], it has a single maximum. (The proofs of Lemma 3.1, Lemma 3.2, and Theorem 4.1 of [2] show the convexity; also see Theorem 94 (p. 76), Theorem 99 (p. 80), and par. 6.14 (pp. 150–152) of [4]). It may be verified that $\partial J_n'(0,1)/\partial g = 0$ for $\frac{\partial p_0}{\partial g} = \frac{\partial p_1}{\partial g}$, which implies that $p_0 = q_1$, resulting in $g = (\mu_0 + \mu_1)/2$. Thus the maximum value attained by $J_n'(0,1)$ is given by

$$(11)\qquad J_n'(0,1) = 2n(\hat{p}_0 - \hat{q}_0)\log\frac{\hat{p}_0}{\hat{q}_0}, \text{ where } \hat{p}_0$$

is defined in (2) above. The efficiency of the grouping for the gauge setting $g = (\mu_0 + \mu_1)/2$, for different values of $(\mu_1 - \mu_0)/\sigma$ is shown in the following table:

$\frac{\mu_1 - \mu_0}{\sigma}$	$\hat{p}_0$	$J_n'(0,1)/n$	$\frac{J_1'(0,1)}{J_1(0,1)}$
0*	0.5	0	0.6366 (2/π)
.04	0.50797 83	0.00102	0.6366
.10	0.51993 88	0.00636	0.6364
.50	0.59870 63	0.15796	0.6318
1.00	0.69146 25	0.61801	0.6180
1.50	0.77337 26	1.34221	0.5965
2.00	0.84134 47	2.27782	0.5695
3.00	0.93319 28	4.56897	0.5077
9.00	0.99999 66	25.59262	0.3109
∞**	1.0	∞	0.2500 (¼)

* Limiting values as $(\mu_1 - \mu_0)/\sigma$ approaches 0 as a limit.
** Limiting values as $(\mu_1 - \mu_0)/\sigma$ approaches ∞ as a limit.

If g is taken as μ_0, then for $(\mu_1 - \mu_0)/\sigma = 1$, $J_1'(0,1) = .56850$ and $J_1'(0,1)/J_1(0,1) = .569$.

As before, we seek the region of acceptance A# from among the regions A, where A# and A satisfy

$$(12)\quad \sum_{A\#}\frac{n!}{z!(n-z)!}p_0^{\,z}q_0^{\,n-z} = \sum_{A}\frac{n!}{z!(n-z)!}p_0^{\,z}q_0^{\,n-z} = 1-\alpha$$

and

$$(13)\quad \sum_{A\#}\frac{n!}{z!(n-z)!}p_0^{\,z}q_0^{\,n-z}\log\frac{p_0^{\,z}q_0^{\,n-z}}{p_1^{\,z}q_1^{\,n-z}} \geq \sum_{A}\frac{n!}{z!(n-z)!}p_0^{\,z}q_0^{\,n-z}\log\frac{p_0^{\,z}q_0^{\,n-z}}{p_1^{\,z}q_1^{\,n-z}}.$$

Here z is the number of items smaller than the gauge setting. We are led on simplifying to

$$(14)\quad \sum_{A\#}\frac{n!z}{z!(n-z)!}p_0^{\,z}q_0^{\,n-z} \geq \sum_{A}\frac{n!z}{z!(n-z)!}p_0^{\,z}q_0^{\,n-z},$$

from which we infer that A# must be of the form $z \geq m$.

Several mistakes in previous columns have been brought to the attention of the Editors. In the answer to Question 31, Vol. 6, No. 3, there is an error in formula (1): "$F^{(n_1-2)/2}$" should read "$F^{(n_1-2)/2}$". In the answer to Question 34, Vol. 6, No. 4, the variance of the difference between two treatment estimates is incorrectly stated to be "σ_2^2/rE for the b.i.b.d., where $E = v/kr$", instead of the correct "$2\sigma_2^2/rE$ for the b.i.b.d., where $E = v\lambda/kr$".

REFERENCES

[1] *Tables of the Binomial Probability Distribution*, N.B.S. Applied Math. Series 6, G.P.O., Washington, 1949.

[2] S. Kullback and R. A. Leibler, "On information and sufficiency," *Annals of Math. Statistics*, Vol. 22 (1951) pp. 79–86.

[3] S. Kullback, "An application of information theory to multivariate analysis," *Annals of Math. Statistics*, Vol. 23 (1952) pp. 88–102.

[4] G. H. Hardy, J. E. Littlewood and G. Polya, *Inequalities*, Cambridge University Press, 1934.

S. Kullback

THE CROSSING OF REGRESSION CURVES

Question 36. Consider the bivariate distribution of the random variables X and Y. Let $\phi(x) = E(Y|X = x)$ and $\psi(y) = E(X|Y = y)$ be continuous for all x and y, respectively. Is it necessary that the graphs of $\phi(x)$ and $\psi(y)$ cross, in the sense that for some (x_0, y_0), $\phi(x_0) = y_0$ and $\psi(y_0) = x_0$? If it is not necessary, then what is a meaningful necessary (or necessary and sufficient) condition for them to cross?

William Kruskal

NEWS ABOUT MEMBERS

Paul Arnolds-Patron has accepted a position as Professor of Economics and head of the Department of Business Administration at the College of the Ozarks.

Robert F. Berner, Lecturer in Statistics at the University of Buffalo, has been promoted to Assistant Professor.

Allan Birnbaum, formerly Statistician of the National Foundation for Infantile Paralysis, is now Lecturer and Director of the Statistical Consulting Service in the Department of Mathematical Statistics at Columbia University.

Robert W. Burgess, chairman of the ASA Committee on Committees, has been named Director of the U. S. Bureau of the Census, succeeding Dr. Roy Peel. Dr. Burgess was for many years economist and actuary for the Western Electric Company, and prior to that he taught mathematics at Cornell and Brown Universities He has long been active in the American Statistical Association, of which he was formerly Vice President and is now a Fellow.

Benjamin Caplan, until recently Economic Adviser of the Economic Stabilization Agency, has rejoined the staff of the Council of Economic Advisers, of which he was formerly a member.

Mary Clem of the Statistical Laboratory, Iowa State College, Ames, has recently returned from an assignment as statistical consultant with the Atomic Bomb Casualty Commission at Hiroshima, Japan.

Richard V. Clemence has been promoted to Associate Professor of Economics at Wellesley College.

E. H. L. Corwin has retired as Executive Secretary of the Committee on Public Health Relations of the New York Academy of Medicine. He has been appointed a consultant to the Medical Society of the County of New York to work with its Public Health Committee.

Helen Demond, Mutual Security Agency, was awarded a citation by Mount Holyoke College for her services to the government as statistician and economist.

Jack W. Dunlap is attending Purdue University where he is working on a project involving the evaluation of training programs and preparing for a Ph.D. in Industrial Psychology.

Samuel J. Dennis, formerly Chief of the Recovery Progress Branch of the Division of Statistics and Reports of the Mutual Security Agency, is now Assistant Chief of the Economic Program Development Staff and Chief of the Trade Analysis Branch.

R. Parker Eastwood has been promoted from Associate Professor to Professor of Business Statistics in the Graduate School of Business of Columbia University.

Victor R. Farhi has recently been awarded a Ph.D. degree from the Graduate School of Business Administration of New York University. He is an economist with Moody's Investors Service and a lecturer at the College of the City of New York.

George Garvey has returned from Panama, where he was an advisor on fiscal matters to the International Bank for Reconstruction and Development, to resume his duties as Senior Economist of the Federal Reserve Bank of New York. He is also a visiting lecturer at Columbia University during the current academic year.

Franklin Graybill of the Statistical Laboratory, Iowa State College, Ames, obtained the Ph.D. degree on the thesis: "On Quadratic Estimates of Variance Components," June 1952.

E. J. Gumbel of the Graduate Faculty of the New School for Social Research has been appointed visiting professor for Mathematical Statistics by the Free (West) University, Berlin, for the 1953 summer term.

Gordon M. Harrington has left Educational Research Corporation in Cambridge, Massachusetts, to accept a position as Associate Consultant in Research with the Connecticut State Department of Education.

Samuel P. Hayes, Jr., after a year in Djakarta as Chief of the ECA-MSA Special Technical and Economic Mission to Indonesia, has returned to Washington as Assistant Director of the Mutual Security Agency in charge of Far East programs.

Paul G. Homeyer and Raymond Jessen of the Statistical Laboratory, Iowa State College, Ames, have just returned from several month assignments by the United Nations at the Rehobothan Agricultural Experiment Station, Israel and the Quito Survey Center, Ecuador, respectively.

T. J. Jaramillo, formerly Actuary of the Philippine-American Life Insurance Company of Manila, has taken a position with the Division of Engineering Mechanics Research of the Armour Research Foundation of the Illinois Institute of Technology.

Ernest H. Jurkat has become a partner in the firm of S. W. Wilkerson Associates, Marketing and Management Counsel in Philadelphia.

Leo Katz of Michigan State College is on sabbatical leave at the Statistical Laboratory, University of California at Berkeley for the 1952-53 school year. He will spend part of his time on some work for the Office of Naval Research.

Hugh B. Killough is serving in Indonesia as economic adviser to the J. G. White Engineering Corporation. He has been granted leave of absence from Brown University.

Lucy Kramer has transferred from the Prices and Cost of Living Division of the Bureau of Labor Statistics to the Farm Labor Analysis Branch of the Division of Reports and Analysis of the Bureau of Employment Security.

Charles B. Lawrence, Jr., who recently completed public opinion surveys on home ownership and self government in Oak Ridge, Tennessee and Richland, Washington for the Census Bureau and the Atomic Energy Commission, has been appointed Statistical Coordinator of a United Nations statistical mission to Colombia, South America. The mission will assist the Colombian government in developing its statistical program.

Gordon D. MacDonald received the degree of doctor of Business Administration from the Graduate School of Business of New York University in October, 1952. His thesis was "A Community Study of Yorkville — Manhattan, New York."

Robert H. Matthias has accepted a position with the Research Division of the Electro-chemicals Department of E. I. du Pont de Nemours Co., Niagara Falls.

Paul Meier has left the Forrestal Research Center to accept a position as Research Associate with the Department of Biostatistics, School of Hygiene and Public Health at the Johns Hopkins University.

Ray Max Mickey of the Statistical Laboratory, Iowa State College, Ames, obtained the Ph.D. degree on the thesis: "An Application of Sequential Tests to a Problem of Quality Control," July 1952.

Allyn M. Munger has been appointed Assistant Advisor on Research, Employee Relations Division, Standard Oil (N.J.). He was formerly Research Consultant with Richardson, Bellows, Henry & Company.

T. Ellison Neal, formerly statistician for the Textile Division of the United States Rubber Company, has taken a position in the Research Department of the Chemstrand Corporation at Decatur, Alabama.

Albert D. Prochnow has been employed in the Management Analysis Division of the Strategic Command Headquarters at Omaha, Nebraska since October 1951.

Thomas E. Pynn, (Major USA) Supply Staff Officer at Fort Bragg will leave shortly for a new assignment in the Far East.

Steve Remias, formerly chief of the Statistics and Analysis Section, Public Health Service, has been appointed Deputy Chief of the Biometrics Division, Office of the Surgeon General, Department of the Air Force.

Samuel B. Richmond has been promoted to Assistant Professor of Business Statistics at the Graduate School of Business of Columbia University.

George S. Roche is now chief of Research and Statistics for the California Department of Employment, replacing Mr. O. B. Railey who has resigned to accept a position in the Technical Assistance Division in the International Labor Office in Geneva.

Herbert Solomon is now an Associate Professor at Teachers College, Columbia University, New York.

Julian C. Stanley Associate Professor of Educational Psychology at George Peabody College for Teachers since June of 1949, has been appointed Associate Professor of Education at the University of Wisconsin, effective in June of 1953.

John Ellsworth Stecklein has accepted a position with the Bureau of Institutional Research at the University of Minnesota. He will be primarily concerned with research in Higher Education and will serve as Examinations Consultant.

Norman R. Stocker is now working as a Statistician on the Manufacturers Committee Staff of the Automobile Manufacturers Association in Detroit, Michigan.

Benjamin J. Tepping is on a one year's leave of absence from the Bureau of the Census to teach statistics in the Department of Mathematics at the University of Michigan. He is also working as a statistical consultant in the Survey Research Center of the University.

Donovan J. Thompson of the Statistical Laboratory, Iowa State College, Ames, obtained the Ph.D. degree on the thesis: "A Theory of Sampling Finite Universes with Arbitrary Probabilities," August 1952.

John E. Walsh formerly a Consultant at the Census Bureau, is now with the Central Evaluation Group, U. S. Naval Ordnance Station, Inyokern, China Lake, California.

Samuel Weiss, Executive Director of the American Statistical Association, has been elected Secretary of the Allied Social Science Associations for 1953.

Loring Wood has transferred from the Office of the U. S. Special Representative in Europe, Mutual Security Agency, to the North Atlantic Treaty Organization, where he is statistical adviser in the Economic and Finance Division.

Royal K. Zeigler, formerly Statistician with the Atomic Energy Commission, has accepted a position as Statistician with the Los Alamos Scientific Laboratory, Los Alamos, New Mexico.

The Association announces with great regret the death of Professor E. V. Huntington, Emeritus Professor of Mathematics at Harvard University, and Consultant to the National Defense Research Committee.

CHAPTER NOTES

CENTRAL NEW JERSEY

The December meeting heard a talk by Frederick F. Stephan of Princeton University on "A Statistical Model for Small Groups."

CHICAGO

Philip M. Hauser of the University of Chicago, who has just returned from a year in Burma, spoke at the December dinner meeting on "Building a Statistical System in an Undeveloped Area." His talk was illustrated by movies which he took in the Far East.

DETROIT

Albert Moellmann, market analyst for *The Detroit News* and chairman of the Historical and Research Committee of the Michigan Chapter of the American Marketing Association, spoke on "Research in the Local Market" at the January meeting.

HAWAII

At the meeting held on November 21, 1952 officers were elected for 1953 and a talk was given by Harry Ball, visiting professor at the University of Hawaii, on the methodology and interview techniques of a survey to estimate the need for the preservation of a rent control law or for changes in the law. The newly elected officers are:

President, R. Takasaki
1st Vice President, Dr. A. L. Tester
2nd Vice President, Fred M. Colland
Secretary-Treasurer, Fred S. W. Loo

Robert C. Schmitt was appointed permanent editor of the local chapter.

LOS ANGELES

At the dinner meeting held on December 10th William A. Miller, Chief Statistician and Secretary-Treasurer of Lane-Wells Co. spoke on the subject of graphic presentation. His talk was accompanied by a display of large charts used by business leaders and firms in Los Angeles.

The speaker at the previous meeting was M. I. Gershenson, Chief of the Division of Labor Statistics and Research of the California Department of Industrial Relations. He spoke on the development of employment statistics in California and some of the problems encountered in preparing such statistics.

NEW ORLEANS

At the meeting of October 28th punch card techniques and uses were discussed. The speaker was Roland T. Pertuit of the Remington Rand Corporation. The subject of the November meeting was the proposed revision of the Consumer Price Index of the Bureau of Labor Statistics. The panel of speakers consisted of Arthur S. Graham, Director of the Chamber of Commerce of the New Orleans Area; Dr. John P. Dyer, Dean of University College at Tulane University, and Samuel Weiss, Chief Statistician of the Bureau of Labor Statistics. The January meeting was devoted to a discussion of the business outlook for 1953, the speakers being Dr. Robert W. French, Dean of the College of Business

Dr. John W. Lederle,
% General Library,
University of Michigan,
Ann Arbor, Michigan

NEW ASA CHAPTERS FORMED IN NEW ORLEANS AND TULSA

The Board of Directors is pleased to announce the granting of Charters to the newly formed Chapters at New Orleans, Louisiana and Tulsa, Oklahoma. Members living in these areas are invited to get in touch with the Chapter Secretaries listed at the back of the Journal of the American Statistical Association, concerning local meetings.

Administration of Tulane University; Robert Elsasser, Business Counselor; P. F. Boyer, Director of the Division of Research of Louisiana State University; and Brown Rawlings of the Atlanta Federal Reserve Bank.

A meeting is scheduled for March 10th on the subject of Statistical Quality Control. The panel will consist of Richard W. Graves, Instructor in Statistics at Tulane University, who will speak on "Why 'Statistical' Quality Control?"; Ferdinand K. Levy, Assistant to the Vice President of Lengsfield Brothers, Inc., whose subject is "Quality Control in the Packaged Food Industry"; and William L. Miron of Michaud Ordnance Plant, who will discuss "Quality Control Applications at the Chrysler Tank Engine Plant."

NEW YORK

At the January 23rd meeting W. Duane Evans, Chief of the Division of Interindustry Economics of the U. S. Bureau of Labor Statistics spoke on "Concepts and Methods of Input-Output Studies." The February 6th meeting was a dinner meeting held at the United Nations in which the Central New Jersey Chapter participated. The chairman was Herbert Marshall, Dominion Statistician for Canada, and the speakers were Harry Campion, Director of the Central Statistical Office of Great Britain, whose subject was "The Work of the U. N. Statistical Commission," and Philip J. Idenburg, Director of the Netherlands Central Statistical Office, who spoke on "Statistics and Culture."

The program of meetings for the balance of the season is as follows:

February 27—Electronic Data Processing, David V. Savidge and Herbert F. Mitchell, Jr., Remington Rand, Inc.

March 6—Medical and Public Health Aspects in Insurance Mortality Investigations, Edward A. Lew, Associate Actuary and Statistician, Metropolitan Life Insurance Company.

March 13—Development of Economic Statistics for New York City on a Small Area Basis; Chairman: Nathan Cherniack. Speakers: To be announced.

April 10—An Appraisal of the 1950 Census of Population, A. Ross Eckler, Deputy Director, U. S. Bureau of the Census.

April 17—Development of Statistical Standards for Government, Stuart A. Rice, Assistant Director for Statistical Standards, Bureau of the Budget, or Walter F. Ryan, Assistant Chief, Office of Statistical Standards.

May 8—Family Health Survey of the Health Insurance Plan of Greater New York, Second Report, Neva Deardorff, Director of HIP.

May 15—Business Outlook for the Last Half of 1953. Speakers: To be announced.

Meetings will be held at 8:00 P.M. in the Remington Rand Hall, 315 4th Ave. near 23rd St., and are preceded by dinner at the Klube Restaurant, 158 East 23rd St. near 3rd Ave., at 6:15. Members of the American Statistical Association who are in New York at the time of the meetings are invited.

OKLAHOMA CITY

The following officers were elected at the annual dinner meeting held on Jan. 7, 1953:

President, W. G. Hill, Bureau of Agricultural Economics, U. S. Department of Agriculture, Oklahoma City; Vice President and Program Chairman, Mitchell Locks, Buerau of Business Research, University of Oklahoma, Norman, Okla; Vice President and Membership Chairman, Bob Staples, Oklahoma Gas & Electric Co., Oklahoma City; Secretary-Treasurer, Wendell Phillips, Southwestern Bell Telephone Co., Oklahoma City.

ST. LOUIS

Newly elected officers are as follows:
President, Roy Wenzlick, Roy Wenzlick & Co.
Secretary, Mrs. Joan Fredricks, Joan Fredricks Market Research

WASHINGTON, D. C.

At the October 20th meeting the November election was discussed by a panel composed of Floyd E. McCaffree of the Research Department of the Republican National Committee; Lewis A. Dexter, Research Department, Democratic National Committee; Louis Bean, Office of the Secretary of Agriculture; and Morris Hansen, Assistant Director for Statistical Standards, Census Bureau. W. S. Woytinsky of Johns Hopkins University acted as moderator. The November meeting was devoted to research in Inter-industry Economics. Duane Evans of the Bureau of Labor Statistics spoke on the technique of Inter-industry Economics, Peyton Stapp of the Budget Bureau sketched its history and Government interest, and Marshall Wood of the Air Force discussed applications to problems.

A joint meeting of the Washington Statistical Society and the American Society for Quality Control was held on December 8th. W. Edwards Deming of the Budget Bureau spoke on "Statistical Quality Control Here and Abroad," and Major General Leslie E. Simon discussed "Statistical Control in Development of Ammunition." On January 19th the Washington Statistical Society held its annual dinner meeting. The subject was the business outlook for 1953. Howard Myers, Director of Research for the Committee for Economic Development, was chairman, and the speakers were Martin Gainsbrugh, Chief Economist of the National Industrial Conference Board, and George L. Conklin, Jr., 2nd Vice President of the Guardian Life Insurance Company.

Crop and livestock estimates will be discussed at the Feb. 16th meeting. A. Bradford Hill of the London School of Hygiene and Tropical Medicine, President of the Royal Statistical Society, is scheduled to speak at the March 23rd meeting on statistical activities of the Medical Research Council.